WHAT IS CLAIMED IS:

1. A Raman amplifier, comprising:

a Raman-amplifying optical fiber having an input end into which signal light including a plurality of signal channels of different wavelengths is inputted and an output end from which the Raman-amplified signal light is outputted;

a first pumping light source for supplying backward pumping light including a plurality of pumping channels of different wavelengths into said Raman-amplifying optical fiber through the output end of said Raman-amplifying optical fiber; and

a second pumping light source for supplying forward pumping light including one or more pumping channels into said Raman-amplifying optical fiber through the input end of said Raman-amplifying optical fiber, the number of pumping channels in the forward pumping light being less than the number of pumping channels in said backward pumping light, and any pumping channel in the forward pumping light having a wavelength shorter than the shortest channel wavelength of the backward pumping light,

wherein the power of the backward pumping light and the power of the forward pumping light are arranged such that the effective length of said Raman-amplifying optical fiber for each pumping channel included in the

backward pumping light becomes longer than the actual length of said Raman-amplifying optical fiber.

2. A Raman amplifier according to claim 1, further comprising:

an input monitor apparatus arranged at the input end side of said Raman-amplifying optical fiber for monitoring the input power level of each signal channel included in the signal light; and

a controller for controlling at least said second pumping light source based on the input power level of each signal channel included in the signal light monitored by said input monitor aparatus such that the output power level of each signal channel is set at a predetermined value.

3. A Raman amplifier according to claim 2, wherein, when the input power level of the signal channels has fluctuated in a predetermined pattern without change of the number of channels in the input signal light, said controller performs feedforward control only on the power of the backward pumping light supplied from said second pumping light source to said Raman-amplifying optical fiber.

4. A Raman amplifier according to claim 2, wherein, when the number of channels in the input signal light has changed, said controller performs feedforward control on the power of each of the pumping

channels involved to Raman amplification of those signal channels whose input power level has not fluctuated exceeding a predetermined value.

5. A Raman amplifier according to claim 2, wherein, based on the input power level of the plurality of signal channels included in the signal light, said controller performs feedforward control on the power of the backward pumping light and the power of the forward pumping light such that the output power level of these signal channels is set at a predetermined value.

6. A Raman amplifier according to claim 2, wherein said controller adjusts the power of the backward pumping light and the power of the forward pumping light with respect to the Raman amplification characteristic of said Raman-amplifying optical fiber to set the Raman amplification gain in the case when the signal light is inputted into said Raman-amplifying optical fiber at 50% or more of the small signal gain itself.

7. A Raman amplifier according to claim 6, wherein the Raman amplification gain in the case when the signal light is inputted into said Raman-amplifying optical fiber is 80% or more of the small signal gain itself.

8. A Raman amplifier according to claim 5,

wherein said controller adjusts the power of the backward pumping light and the power of the forward pumping light with respect to the Raman amplification characteristic of said Raman-amplifying optical fiber to set the Raman amplification gain in the case when the signal light is inputted into said Raman-amplifying optical fiber at 50% or more of the small signal gain itself.

9. A Raman amplifier according to claim 8, wherein the Raman amplification gain in the case when the signal light is inputted into said Raman-amplifying optical fiber is 80% or more of the small signal gain itself.

10. A Raman amplifier according to claim 2, further comprising:

an optical transmission line arranged between said input monitor apparatus and the input end of said Raman-amplifying optical fiber and having a length such that the propagation time of the signal light is greater than or equal to the shortest time necessary for controlling said second pumping light source by said controller.

11. A Raman amplifier according to claim 10, wherein said controller has a function of adjusting the time necessary for controlling said second pumping light source.

12. A Raman amplifier according to claim 10, wherein said optical transmission line serves as a transmission medium for Raman-amplifying the signal light.

13. A Raman amplifier according to claim 10, wherein said optical transmission line includes an optical fiber doped with a rare earth element.

14. A Raman amplifier according to claim 1, further comprising:

an input monitor apparatus arranged at the input end side of said Raman-amplifying optical fiber for monitoring the input power level of each signal channel included in the signal light; and

a dummy signal light supply system for supplying said Raman-amplifying optical fiber with dummy signal light having the same wavelength as the wavelength of the signal channel whose input power level monitored by said input monitor apparatus is less than or equal to a predetermined value.

15. A Raman amplifier according to claim 1, further comprising:

an input monitor apparatus arranged at the input end side of said Raman-amplifying optical fiber for monitoring the input power level of each signal channel included in the signal light;

an output monitor apparatus arranged at the

output end side of said Raman-amplifying optical fiber for monitoring the output power level of each signal channel included in the Raman-amplified signal light; and

a controller for controlling said first and second pumping light sources based on the detection results obtained from said input monitor apparatus and said output monitor apparatus.

16. A Raman amplifier according to claim 15, wherein, at a point of time when the power fluctuation of the signal light at the input end of said Raman-amplifying optical fiber has been detected, said controller performs feedforward control on said first pumping light source, and subsequently feedback control on said first pumping light source at a period slower than the time necessary for the signal light to propagate through said Raman-amplifying optical fiber.

17. A Raman amplifier according to claim 16, further comprising:

an optical transmission line arranged between said input monitor apparatus and the input end of said Raman-amplifying optical fiber and having a length such that the propagation time of the signal light corresponds to the time interval from the time when input power fluctuation is detected to the time when the control for said first pumping light source is

started.

18. A Raman amplifier according to claim 15, wherein, at the time when power fluctuation of the signal light at the output end of said Raman-amplifying optical fiber has been detected, said controller performs feedforward control on said second pumping light source, and subsequently feedback control on said second pumping light source at a period slower than the time necessary for the signal light to propagate through said Raman-amplifying optical fiber.

19. A Raman amplifier according to claim 15, wherein, at the time when power fluctuation of the signal light at the input end of said Raman-amplifying optical fiber has been detected, said controller performs feedforward control on said first pumping light source, and at the time when power fluctuation of the signal light at the output end of said Raman-amplifying optical fiber has been detected, said controller performs feedforward control on said second pumping light source, and subsequently said controller performs feedback control on each of said first and second pumping light sources at a period slower than the time necessary for the signal light to propagate through said Raman-amplifying optical fiber.

20. A Raman amplifier according to claim 15, wherein, at the time when power fluctuation of the

signal light at the input end of said Raman-amplifying optical fiber has been detected, said controller performs feedforward control on said first pumping light source, and subsequently feedback control on each of said first and second pumping light sources at a period slower than the time necessary for the signal light to propagate through said Raman-amplifying optical fiber.

21. A Raman amplifier according to claim 20, further comprising:

an optical transmission line arranged between said input monitor apparatus and the input end of said Raman-amplifying optical fiber and having a length such that the propagation time of the signal light corresponds to the time interval from the time when input power fluctuation is detected to the time when the control for said first pumping light source is started.

22. An optical communication system including a Raman amplifier according to claim 1.